Baseline sampling at the Portland Harbor Superfund Site
How much natural recovery is occurring?

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Objectives

- Collect unbiased baseline dataset to assess pre-construction conditions and set benchmark for post-remediation monitoring.
- Evaluate dynamics of depositional processes across time.
- Estimate temporal change in surface sediment and smallmouth bass fish tissue accounting for statistical bias between different sampling programs.

Background

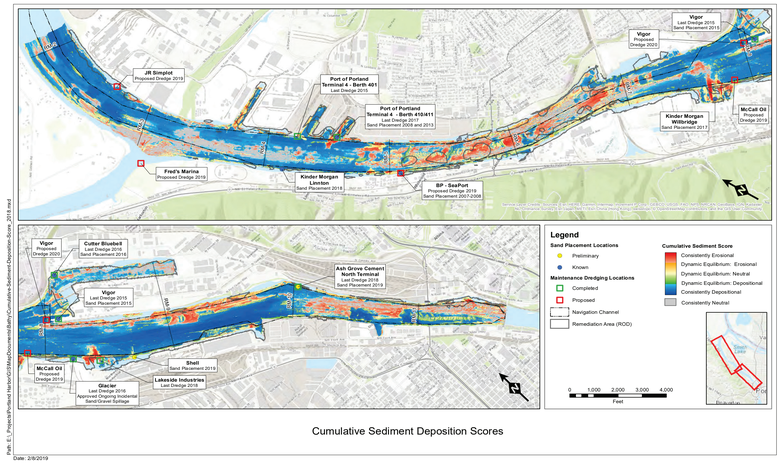
- Portland Harbor Superfund Site (PHSS) is a large, complex sediment cleanup site in Portland, Oregon.
- Record of Decision (ROD) signed in 2017 established remedial action levels (RALs) and cleanup levels.
- Sixty-four contaminants of concern (COCs) at PHSS, six of which are focused COCs. Concentrations of the focused COCs establish the remedial footprint.
- Six bathymetry surveys performed at PHSS: 2002 (two surveys completed), 2003, 2004, 2009, and 2018.
- Feasibility study (FS) database contains samples collected from 1997 to 2010. Baseline sampling occurred in 2018.

Methods

- Bathymetry survey pixels scored as erosional (< -2.5 centimeters per year [cm/yr]), depositional (> 2.5 cm/yr), or neutral (-2.5 cm/yr to 2.5 cm/yr) across 15 pairs of surveys as per EPA (2016).
- FS surface sediment data were debiased by taking the median of all points within a baseline sample grid cell and comparing to the associated baseline sample.
- Sediment temporal change evaluated at sitewide and sediment decision unit (SDU) scales using regression analysis and paired difference method, respectively.
- First order decay model developed to estimate decreases in smallmouth bass tissue concentrations.

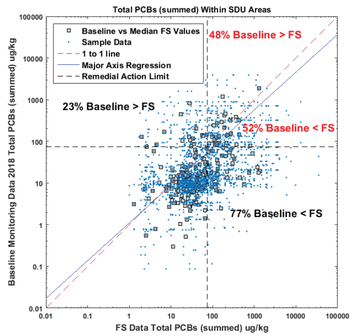
Results

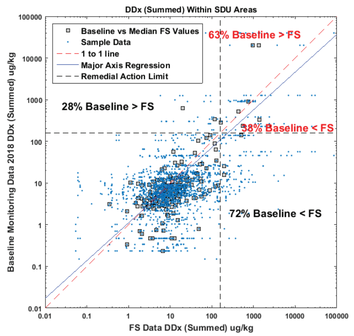
Most of PHSS is consistently depositional. However, most of remedy footprint is in dynamic equilibrium or consistently erosional.

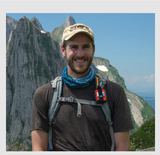


Cumulative Sediment Deposition Scores

Surface sediment with contaminant concentrations less than RALs in FS data show sitewide decreases. Areas greater than RALs persistent and baseline concentrations increased relative to FS data for some COCs.







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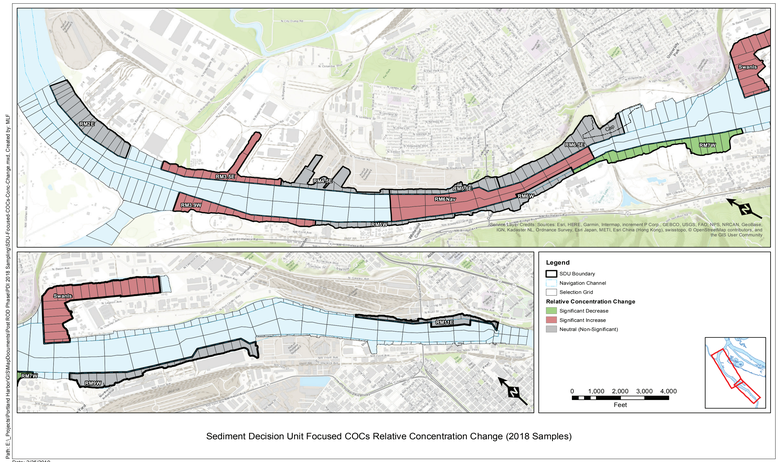
References

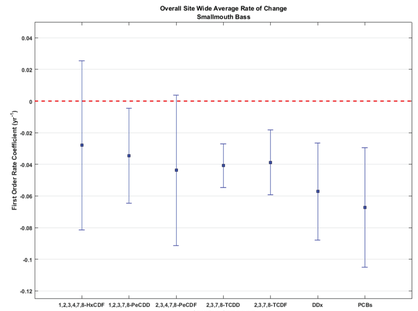
EPA. 2016. *Portland Harbor RI/FS: Feasibility Study.* Prepared by U.S. Environmental Protection Agency and CDM Smith. June.

Results (continued)

Temporal change within SDUs predominantly neutral (non-significant).



Sediment Decision Unit Focused COCs Relative Concentration Change (2018 Samples)



Smallmouth bass first order model shows sitewide contaminant decreases occurring at rates less than 10% per year.

Conclusions

- Surface sediment concentrations exceeding RALs have been persistent since the 2000s while lower concentration areas have decreased due to source control efforts and natural recovery.
- Temporal change at smaller spatial scales is predominantly neutral (non-significant) and driven by site-specific factors such as the dynamics of sediment deposition and erosion.
- Active measures such as capping and dredging are needed to decrease contaminant concentrations (and therefore risk) in sediment and fish in a timely manner.